

A kilometer-scale study of the habitat of 3.43 Ga stromatolites: Strelley Pool Chert, Pilbara Craton, Western Australia.

Abigail Allwood

*Australian Centre for Astrobiology
Macquarie University
NSW 2070
AUSTRALIA*
aallwood@els.mq.edu.au

Malcolm Walter

*Australian Centre for Astrobiology
Macquarie University
NSW 2070
AUSTRALIA*

Martin J. Van Kranendonk

*Geological Survey of Western Australia
100 Plain St, Perth, Western Australia
AUSTRALIA*

Balz S. Kamber

*ACQUIRE Laboratories
University of Queensland, Richards Building, St. Lucia, QLD
AUSTRALIA*

Conical stromatolites in the 3.43 Ga Strelley Pool Chert (SPC; Pilbara Craton, Western Australia; Hofmann et al., 1999) are perhaps the most widely exposed and best-preserved putative Early Archean fossils. To understand the environment in which the SPC formed and determine the processes that influenced stromatolite development, we investigated a 20 km-long arc of ridge-top outcrops centering upon the Trendall locality in the North Pole Dome.

Stromatolites in the area occur in a 2-20 m-thick laminated carbonate-chert succession with lowermost beds that encrust a 1-2 m-thick jaspilite boulder conglomerate. The conglomerate is interpreted as a wave cut rocky shoreline deposit and overlies a major erosional unconformity. Interbedding and precipitous relief at the conglomerate-carbonate contact suggest rapid and immediate carbonate deposition and close ties between areas of stromatolite development and the shoreline. Laminae among the stromatolites commonly fine upwards and show low angle cross-lamination, scours, intraclast microconglomerates and desiccation cracks. REE geochemistry indicates carbonate and chert laminae formed from seawater, not hydrothermal fluids. These observations suggest that: the stromatolites formed under shallow to intermittently exposed marine (shallow platform / intertidal) conditions; sediments were not purely chemical precipitates; and at least some laminae formed by mechanical deposition of

granular sediment. Development of the stromatolitic carbonate platform marked a brief hiatus in a long period of igneous and hydrothermal activity, suggesting that relatively placid shallow marine conditions were more important than hydrothermal processes for the flourishing of a large, complex, Early Archean ecosystem, now highly visible in the fossil record.

References:

Hofmann, H.J., Grey, K., Hickman, A.H. and Thorpe, R.I., 1999, Origin of 2.45 Ga coniform stromatolites in Warrawoona Group, Western Australia: Geological Society of America Bulletin, v. 111, p. 1256-1262.